

WHAT IS CLAIMED IS:

1. A system for detecting radiation, comprising:
a cell comprising a medium having a plurality of
states, the cell operable to:

5 receive a first laser drive field having a
frequency approximately equivalent to a transition
frequency between a first state and a second state of the
plurality of states;

10 receive a second laser drive field having a
frequency approximately equivalent to a transition
frequency between the first state and a third state of
the plurality of states;

15 receive an infrared field having a frequency
approximately equivalent to a transition frequency
between the third state and a fourth state of the
plurality of states, the medium operable to have a
transition between the second state and the third state
substantially forbidden to support optimal coherence on
the transition between the second state and the third
20 state; and

upconvert the infrared field to generate a
detectable field having a frequency approximately
equivalent to a transition frequency between the second
state and the fourth state of the plurality of states;
25 and

a detector operable to detect the detectable field.

2. The system of Claim 1, wherein the cell is
operable to continuously upconvert the infrared field to
30 generate the detectable field.

3. The system of Claim 1, wherein:

an intensity of the first laser drive field is of the order of a saturation intensity of a transition between the first state and the second state; and

5 an intensity of the second laser drive field is of the order of a saturation intensity of a transition between the first state and the third state.

4. The system of Claim 1, wherein:

10 the first laser drive field is approximately detuned from a first resonance frequency of the medium; and

the second laser drive field is approximately detuned from a second resonance frequency of the medium.

15 5. The system of Claim 1, wherein:

a detuning of the first laser drive field is approximately equivalent to a linewidth associated with a transition from the first state to the second state; and

20 a detuning of the second laser drive field is approximately equivalent to a linewidth associated with a transition from the first state to the third state.

6. The system of Claim 1, wherein:

25 a nonlinear susceptibility of the medium at the frequency of the infrared field is approximately equal to a linear susceptibility of the medium at the frequency of the infrared field; and

30 a nonlinear susceptibility of the medium at the frequency of the detectable field is approximately equal to a linear susceptibility of the medium at the frequency of the detectable field.

7. The system of Claim 1, wherein an angle between a first propagation direction of the first laser drive field and a second propagation direction of the second laser drive field is less than two degrees.

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8. The system of Claim 1, wherein the cell comprises a molecular vapor.

9. The system of Claim 1, wherein the cell
10 comprises an atomic vapor.

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10. A system for detecting radiation, comprising:
a cell comprising a semiconductive medium having a plurality of levels, the cell operable to:

5 receive a laser drive field having a frequency approximately equivalent to a transition frequency between a first level and a second level of the plurality of levels;

10 receive an infrared field having a frequency approximately equivalent to a transition frequency between the second level and a third level of the plurality of levels, the medium operable to have a transition between the first level and the second level partially forbidden to support an optimal coherence on the transition between the first level and the second
15 level; and

upconvert the infrared field to generate a detectable field having a frequency approximately equivalent to a transition frequency between the first level and the third level; and

20 a detector operable to detect the detectable field.

11. The system of Claim 10, wherein the cell is operable to continuously upconvert the infrared field to generate the detectable field.

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12. The system of Claim 10, wherein a photon energy of the laser drive field is less than a transition energy between the first level and the second level by approximately 10 to 20 meV.

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13. The system of Claim 10, wherein:
the first level comprises a hole level;
the second level comprises a first electron level;
and
5 the third level comprises a second electron level.

14. The system of Claim 10, wherein:
the first level comprises an electron level;
the second level comprises a first hole level; and
10 the third level comprises a second hole level.

15. The system of Claim 10, wherein the cell
comprises a plurality of quantum dots.

15 16. The system of Claim 10, wherein the cell
comprises a stack of approximately ten to twenty layers
of quantum dots.

17. The system of Claim 10, wherein the cell
20 comprises a plurality of quantum wells.

18. A method for detecting radiation, comprising:
receiving a first laser drive field at a cell
comprising a medium having a plurality of states, the
first laser drive field having a frequency approximately
5 equivalent to a transition frequency between a first
state and a second state of the plurality of states;

receiving a second laser drive field having a
frequency approximately equivalent to a transition
frequency between the first state and a third state of
10 the plurality of states;

receiving an infrared field having a frequency
approximately equivalent to a transition frequency
between the third state and a fourth state of the
plurality of states, the medium having a transition
15 between the second state and the third state
substantially forbidden to support optimal coherence on
the transition between the second state and the third
state;

generating, by upconverting the infrared field, a
20 detectable field having a frequency approximately
equivalent to a transition frequency between the second
state and the fourth state; and

detecting the detectable field.

25 19. The method of Claim 18, further comprising
generating the detectable field by continuously
upconverting the infrared field.

20. The method of Claim 18, wherein:
30 an intensity of the first laser drive field is of
the order of a saturation intensity of a transition
between the first state and the second state; and

an intensity of the second laser drive field is of the order of the saturation intensity of a transition between the first state and the third state.

5 21. The method of Claim 18, further comprising:
 approximately detuning the first laser drive field
 from a first resonance frequency of the medium; and
 approximately detuning the second laser drive field
 from a second resonance frequency of the medium.

10 22. The method of Claim 18, further comprising:
 detuning of the first laser drive field, the
 detuning being approximately equivalent to a linewidth
 associated with a transition from the first state to the
15 second state; and

 detuning of the second laser drive field, the
 detuning being approximately equivalent to a linewidth
 associated with a transition from the first state to the
 third state.

20 23. The method of Claim 18, wherein:
 a nonlinear susceptibility of the medium at the
 frequency of the infrared field is approximately equal to
 a linear susceptibility of the medium at the frequency of
25 the infrared field; and

 a nonlinear susceptibility of the medium at the
 frequency of the detectable field is approximately equal
 to a linear susceptibility of the medium at the frequency
 of the detectable field.

30 24. The method of Claim 18, wherein an angle
 between a first propagation direction of the first laser

drive field and a second propagation direction of the second laser drive field is less than two degrees.

25. The method of Claim 18, wherein the cell
5 comprises a molecular vapor.

26. The method of Claim 18, wherein the cell comprises an atomic vapor.

27. A method for detecting radiation, comprising:

receiving a laser drive field at a cell comprising a
semiconductive medium having a plurality of levels, the
laser drive field having a frequency approximately
5 equivalent to a transition frequency between a first
level and a second level of the plurality of levels;

receiving an infrared field having a frequency
approximately equivalent to a transition frequency
between the second level and a third level of the
10 plurality of levels, the medium operable to have a
transition between the first level and the second level
partially forbidden to support an optimal coherence on
the transition between the first level and the second
level; and

15 upconverting the infrared field to generate a
detectable field having a frequency approximately
equivalent to a transition frequency between the first
level and the third level; and

detecting the detectable field.

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28. The method of Claim 27, further comprising
continuously upconverting the infrared field to generate
the detectable field.

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29. The method of Claim 27, wherein a photon energy
of the laser drive field is less than a transition energy
between the first level and the second level by
approximately 10 to 20 meV.

30. The method of Claim 27, wherein:
the first level comprises a hole level;
the second level comprises a first electron level;
and
5 the third level comprises a second electron level.

31. The method of Claim 27, wherein:
the first level comprises an electron level;
the second level comprises a first hole level; and
10 the third level comprises a second hole level.

32. The method of Claim 27, wherein the cell
comprises a plurality of quantum dots.

15 33. The method of Claim 27, wherein the cell
comprises a stack of approximately ten to twenty layers
of quantum dots.

20 34. The method of Claim 27, wherein the cell
comprises a plurality of quantum wells.

35. A system for detecting radiation, comprising:
means for receiving a first laser drive field, a
second laser drive field, and an infrared field and for
generating a detectable field by upconverting the
5 infrared field, the receiving and generating means having
a plurality of states;

means for detecting the detectable field; and
wherein:

10 the first laser drive has a frequency approximately
equivalent to a transition frequency between a first
state and a second state of the plurality of states;

the second laser drive has a frequency approximately
equivalent to a transition frequency between the first
state and a third state of the plurality of states;

15 the infrared field has a frequency approximately
equivalent to a transition frequency between the third
state and a fourth state of the plurality of states;

the generated detectable field has a frequency
approximately equivalent to a transition frequency
20 between the second state and the fourth state; and

the medium has a transition between the second state
and the third state substantially forbidden to support
optimal coherence on the transition between the second
state and the third state.

36. A system for detecting radiation, comprising:

a cell comprising a medium having a plurality of states, the cell operable to:

receive a first laser drive field having a
5 frequency approximately equivalent to a transition
frequency between a first state and a second state of the
plurality of states, the first laser drive field having
an intensity of the order of a saturation intensity of a
transition between the first state and the second state,
10 a detuning of the first laser drive field is
approximately equivalent to a linewidth associated with
the transition from the first state to the second state;

receive a second laser drive field having a
frequency approximately equivalent to a transition
15 frequency between the first state and a third state of
the plurality of states, the second laser drive field
having an intensity of the order of the saturation
intensity of a transition between the first state and the
third state, a detuning of the second laser drive field
20 is approximately equivalent to a linewidth associated
with the transition from the first state to the third
state;

receive an infrared field having a frequency
approximately equivalent to a transition frequency
25 between the third state and a fourth state of the
plurality of states, the medium operable to have a
transition between the second state and the third state
substantially forbidden to support optimal coherence on
the transition between the second state and the third
30 state, an angle between a first propagation direction of
the first laser drive field and a second propagation
direction of the second laser drive field being less than
two degrees; and

continuously upconvert the infrared field to
generate a detectable field having a frequency
approximately equivalent to a transition frequency
between the second state and the fourth state; and

5 a detector operable to detect the detectable field.

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